

5. Healthy Soils for Healthy Cities- World Soil Day 2025- Environment

World Soil Day (WSD) is annually celebrated on 5th of December to raise global awareness about the role soils play in agricultural development, ecosystem functions and food security.

About World Soil Day

Global Mandate and Institutional Genesis

1. **Origin-** The concept was initially proposed by the International Union of Soil Sciences (IUSS) in 2002.
2. **Official Recognition-** Following Food and Agriculture Organization of the United Nations (FAO) endorsement (2013), the UN General Assembly officially established WSD in 2014, led by the Kingdom of Thailand.
3. **Institutional Support-** The Food and Agriculture Organization (FAO) facilitates WSD's global advocacy within the framework of the Global Soil Partnership (GSP).

2025 Theme- "Healthy Soils for Healthy Cities"

4. **Urban Imperative-** This theme underscores how urban and peri-urban soils are vital for food production, water filtration, carbon storage, and regulating urban heat, cautioning specifically against soil sealing and unchecked urbanization.
5. **The One Health Approach-** It formally adopts the One Health Approach, recognizing the intrinsic link between the health of the soil, the environment, and urban human populations.
6. **SDG Convergence-** The theme is fundamentally interlinked with SDG 11 (Sustainable Cities) and SDG 15 (Life on Land).

Soil as Critical Urban Infrastructure

7. **Climate & Heat Mitigation-** Vegetated soils cool the city through evapotranspiration, directly countering the Urban Heat Island (UHI) effect.
8. **Hydrological Resilience-** Permeable soil acts like a natural sponge, rapidly absorbing rainfall to prevent flash floods and efficiently facilitating groundwater recharge.
9. **Local Ecosystem Services-** It supports urban agriculture for local food security, sustains biodiversity, and provides access to green spaces essential for public mental well-being.
10. **Critical Threats-** Urban soil is actively degraded by widespread soil sealing (pavement/construction), chemical contamination (heavy metals), and organic matter loss.

The 2024-2025 Disaster Reality Check-

11. **The Wake-up Call-** The devastating 2024 floods (Delhi, Chennai, Himachal Pradesh) and the 2025 Wayanad-Kalakkod landslide tragedy have provided a stark reality check.

Policy Failure Exposed- These events exposed how large-scale soil sealing and loss of vegetative cover have systematically turned once manageable rainfall events into urban and rural disasters, underscoring the urgent need for comprehensive soil restoration and urban planning reforms.

Significance of Soil Health for India

Soil is a living, dynamic, and effectively non-renewable resource on human timescales. Its health underpins India's food systems, climate resilience, economic stability, and social equity.

Food Security and Economic Stability

Soil forms the foundation for over 95% of global food production, making it central to India's food security architecture.

Healthy soils ensure optimal nutrient availability, water retention, and root development, directly influencing crop productivity and yield stability.

Given that nearly 45% of India's workforce depends on agriculture and allied activities, soil degradation threatens rural livelihoods and agrarian incomes.

Declining soil fertility increases farmers' dependence on chemical inputs, raising costs of cultivation and compressing profit margins.

At the macro level, soil degradation imposes an annual economic loss of ₹2.5–3 lakh crore, through reduced productivity, higher input use, and land abandonment.

Social Costs and Human Development

Soil micronutrient depletion contributes to “hidden hunger”, particularly deficiencies of zinc, iron, and boron.

Over one-third of India’s population suffers from micronutrient deficiencies linked to poor soil health, leading to–

1. Lower labour productivity
2. Impaired cognitive development in children
3. Higher public health expenditure

These effects perpetuate intergenerational poverty and malnutrition, undermining SDG-2 (Zero Hunger) and SDG-3 (Good Health).

Climate Change Mitigation and Adaptation

Soil is the largest terrestrial carbon sink, storing nearly twice the carbon of the atmosphere and all vegetation combined.

Enhancing Soil Organic Carbon (SOC) improves–

1. Carbon sequestration
2. Soil structure and aggregation
3. Water-holding capacity and drought resilience

SOC enhancement is among the most cost-effective natural climate solutions, critical for India’s Net-Zero ambitions.

Healthy soils also buffer climate extremes by reducing erosion during floods and improving moisture retention during droughts.

Water Security and Urban Resilience

Healthy soils function as a natural sponge, absorbing rainfall, improving groundwater recharge, and filtering pollutants.

In rain-fed regions (nearly 50% of India’s agriculture), soil structure directly determines crop survival.

In urban areas–

1. Soil permeability mitigates the Urban Heat Island Effect
2. Reduces surface runoff and urban flooding
3. Stabilizes slopes and lowers landslide risks

Soil sealing due to urban expansion severely disrupts these ecosystem services.

Biodiversity and Social Equity

A single teaspoon of healthy soil contains billions of microorganisms, forming the base of terrestrial biodiversity.

Soil degradation disproportionately impacts–

1. Small and marginal farmers
2. Women farmers
3. Pastoral communities

The colonial-era classification of biodiverse grasslands as “wastelands” has led to–

4. Destruction of commons (e.g., Banni, Solapur)
5. Loss of pastoral livelihoods
6. Forced rural-to-urban migration

Soil degradation thus deepens social inequity and rural distress.

Global Responsibility and Intergenerational Justice

India supports 17% of the global population on only 2.4% of the world’s land area, amplifying the ethical responsibility to conserve soil.

Soil protection is integral to–

1. Ethics of the Anthropocene
2. Intergenerational equity
3. Sustainable development leadership

Rural–Urban Linkages

Healthy rural soils act as a buffer against distress migration, reducing pressure on urban infrastructure. Degraded rural soils accelerate unplanned urbanization, resulting in–

1. Soil sealing
2. Slum expansion
3. Urban ecological stress

Challenges to Soil Health in India

India's soil degradation is multi-dimensional, rooted in chemical misuse, physical degradation, policy blind spots, and governance fragmentation.

Chemical and Nutrient Degradation

Nutrient Imbalance– Excessive urea subsidy has distorted the N-P-K ratio (far from the ideal 4-2-1). Leads to secondary and micronutrient deficiencies.

Zinc Deficiency– Over 40% of Indian soils are zinc-deficient, affecting crop nutrition and human health.

Salinization and Contamination

Poor irrigation practices cause salt accumulation.

Industrial effluents and municipal waste introduce heavy metals, contaminating soils and groundwater.

Physical and Organic Degradation

Soil Sealing and Compaction

1. Urban India seals about 50,000 hectares annually under concrete.
2. Heavy farm machinery compacts soil, reducing aeration and root penetration.

Loss of Soil Organic Carbon–

3. Intensive monocropping, residue burning, and chemical dependency have caused a ~30% SOC decline in 50 years.
4. Reduced SOC weakens soil structure, fertility, and climate resilience.

Policy Arbitrariness and Blind Spots

The “Wasteland” Myth

1. Semi-arid grasslands are misclassified, encouraging conversion and afforestation with invasive species.
2. Grasslands like Banni are Critical Soil Carbon Ecosystems, storing carbon below ground via deep root systems.

Invasive Species Impact

3. Species such as *Prosopis juliflora* have displaced native biodiversity and pastoral livelihoods.

Farmland Canopy Crisis

4. Nearly 11% of large farm trees lost by 2018.
5. Scattered trees are excluded from Forest Survey of India metrics, creating a data and policy blind spot.
6. Farmers lack economic incentives to preserve mature trees.

Governance and Federal Challenges

Soil and land are State Subjects, complicating uniform national action.

Key issues include–

1. Uneven scheme implementation
2. Absence of a standardized national soil monitoring framework
3. Conflicts between agriculture, urban development, and infrastructure policies

4. Weak enforceability of soil-centric regulations like mandatory Soil Health Index in EIAs

Global Initiatives for Soil Health

Policy and Governance Frameworks

UN Convention to Combat Desertification (UNCCD)

1. Focuses on Sustainable Land Management.
2. Targets **Land Degradation Neutrality (LDN) by 2030** (SDG 15.3).

Global Soil Partnership (FAO)

3. Promotes Sustainable Soil Management.
4. Institutionalized World Soil Day and the Revised World Soil Charter.

UNFCCC and NDCs–

5. Soil integrated into National Adaptation Plans.
6. India, despite commitments, lacks a quantified SOC target in its NDCs.

Climate Mitigation Initiatives

4 per 1000 Initiative–

1. Seeks a 0.4% annual increase in SOC.
2. Promotes agroecology, conservation agriculture, and agroforestry.

Action, Finance, and Monitoring

Coalition of Action for Soil Health (CA4SH)

1. Addresses adoption barriers, finance gaps, and monitoring deficits.

Scientific Efforts

2. ITPS provides global soil science guidance.
3. UNESCO is working towards a World Soil Health Index.

India's Initiatives for Soil Health

Nutrient Management and Farmer Empowerment

Soil Health Card Scheme, Neem-Coated Urea, Paramparagat Krishi Vikas Yojana, Promotion of Soil Health FPOs

Sustainable Land Management

Integrated Nutrient Management. Conservation Agriculture. Agroforestry systems

Urban Soil Interventions

Smart Cities Mission initiatives, Global best-practice templates from EU and Singapore

Restoration and Technology

CAMPA-funded grassland restoration (e.g., Solapur), AI-based nutrient mapping, soil sensors, drones, and ISRO remote sensing

Way Forward– A Soil-Centric Governance Model

Mission-Mode Policy Reform

National Mission on Soil Organic Carbon with measurable targets

Mandatory Soil Health Index in EIAs

Decolonization and Incentives

Reclassify grasslands as Critical Soil Carbon Ecosystems

National Farmland Tree Policy with Stewardship Payments

Urban Soil Mandates

40% permeable surface norms

Urban Farming Policy 2.0

Constitutional and Legal Measures

Right to a Healthy Environment under Articles 21 and 48-A

Use MGNREGA for soil restoration

Integrate SOC targets into India's NDCs

Financial and Behavioural Incentives

Nutrient-Based Subsidy reform. Link SHC to KCC and crop insurance. Pilot DBT stewardship payments

Education and Decentralization

Soil Conservation Day in schools. NCERT curriculum integration. Panchayat-led soil governance

Conclusion

Healthy soils are the ecological foundation of a Viksit Bharat. World Soil Day 2025 underscores the need to shift from short-term exploitation to long-term stewardship. Embedding soil health into agricultural, urban, climate, and economic planning is indispensable for ensuring food security, climate stability, and intergenerational justice.

Source- <https://www.thehindu.com/opinion/op-ed/a-day-to-pause-and-come-down-to-earth/article70358386.ece>